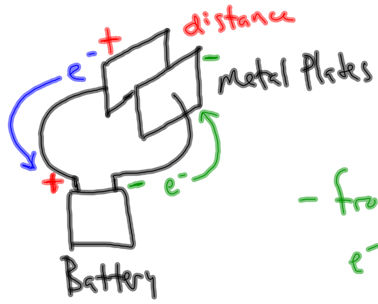
Capacitance Notes 11.9.11 AP Physics

Capacitance:



- from movement of e⁻, a ΔV is established bet. the plates.
- this creates an $\bar{E}$-field bet. the plates.

• Capacitance ≡ $\dfrac{\text{charge}}{\text{electric potential difference}}$

$$C \equiv \frac{Q}{\Delta V}$$

• Units: 1 Farad (F) = $1 \frac{C}{V}$

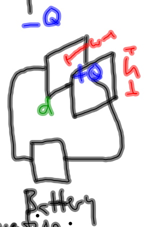
• Three kinds:

✳ 1. Parallel-plate

2. Cylindrical

3. Spherical

• For a parallel-plate capacitor:



$A = wh$

d is separation distance

$\sigma = \dfrac{Q}{A}$ (lowercase sigma) surface charge density

Quick Derivation:

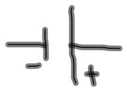
$$E = \frac{\sigma}{\varepsilon_0} = \frac{Q}{\varepsilon_0 A}$$

ε_0 (epsilon naught) permitivity of free space

$$\Delta V = Ed = \frac{Qd}{\varepsilon_0 A} \qquad C = \frac{Q}{\Delta V} = \frac{Q}{\frac{Qd}{\varepsilon_0 A}} = \frac{\varepsilon_0 A}{d}$$

- **Combining Capacitors:**

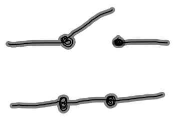
  - Components and Schematic representation:

Battery 

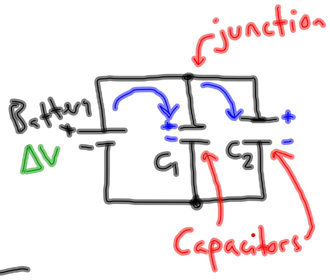
Wire

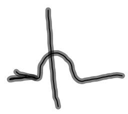
Resistor 

Capacitor 

Switch 

  - Wiring in parallel:

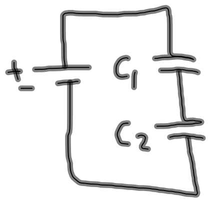




- technically, e^- go from − to +.
- what we call current goes from + to −. (conventional current)

$$C_{net} = C_1 + C_2 + \ldots$$

  - Wiring in Series:



$$\frac{1}{C_{net}} = \frac{1}{C_1} + \frac{1}{C_2} + \ldots$$